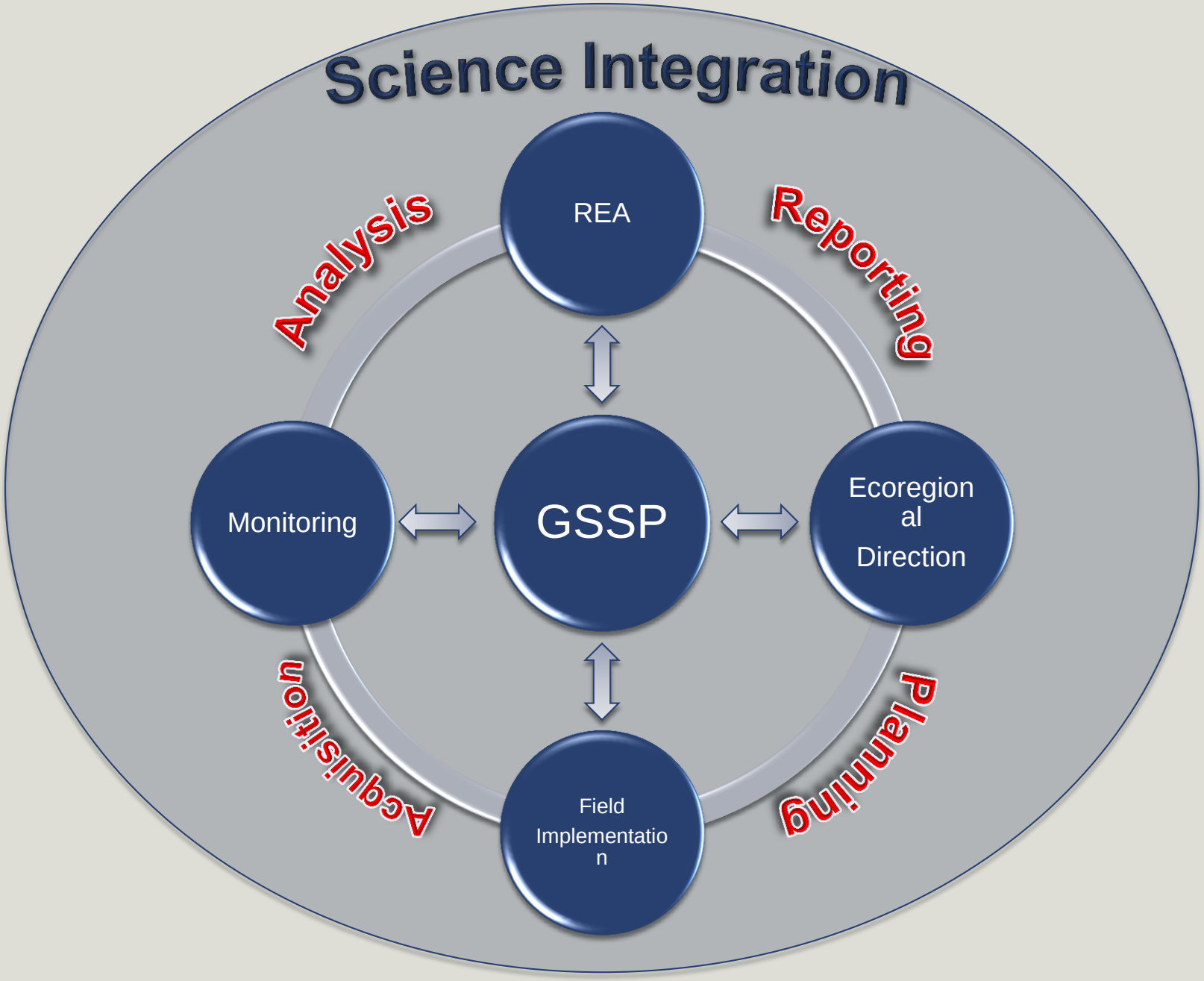



BLM Remote Sensing

BLM's Landscape Approach



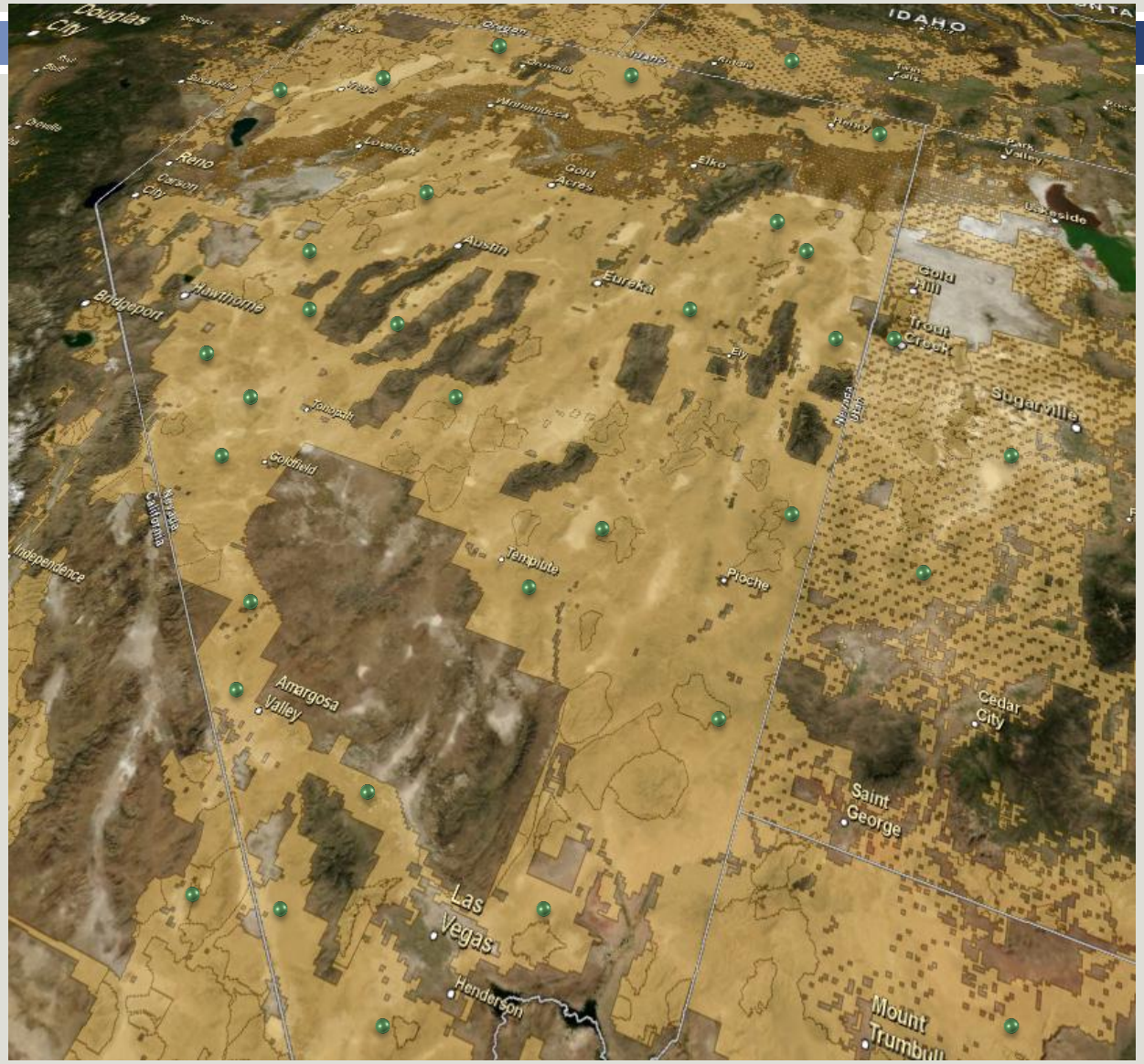
AIM Foundations

- Acquiring, assessing, and reporting information through the integration of fundamental processes, including:
  - application of a consistent set of **core quantitative indicators** and **consistent collection methods**;
  - implementation of a **statistically valid, scalable sampling framework**;
  - application and **integration of remote sensing** technologies to the maximum extent possible;
  - implementation and use of related **data acquisition and management** plans (e.g., GSSP, EGIS, etc.)

Core Indicators & Methods

- Three Core Methods for Six Core Indicators
  - Line-point intercept + species search
    - 1. Bare ground
    - 2. Vegetation composition
    - 3. Non-native invasive species
    - 4. Plant species of management concern
  - Height along selected LPI points
    - 5. Vegetation height
  - Canopy gap intercept
    - 6. Proportion of soil in large inter-canopy gaps (when gaps present)

Sample Design

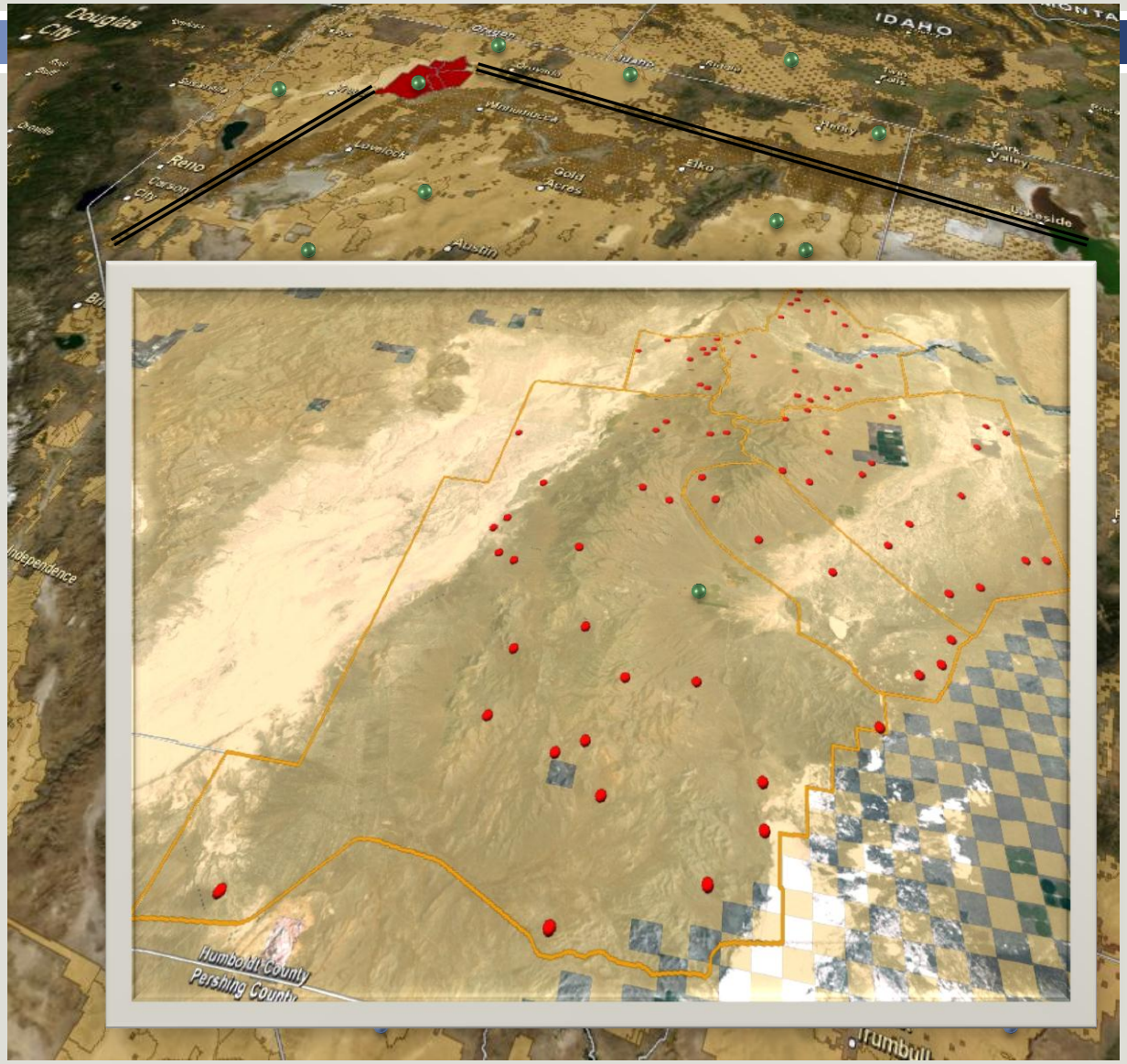


Extensive Sampling*

- Low density network of sampling locations
- Non-forested BLM-managed lands nationwide
- Designed initially to meet regional/national needs
- Insufficient number of samples for local management needs

*Hypothetical points for illustration only

Sample Design



Extensive Sampling*

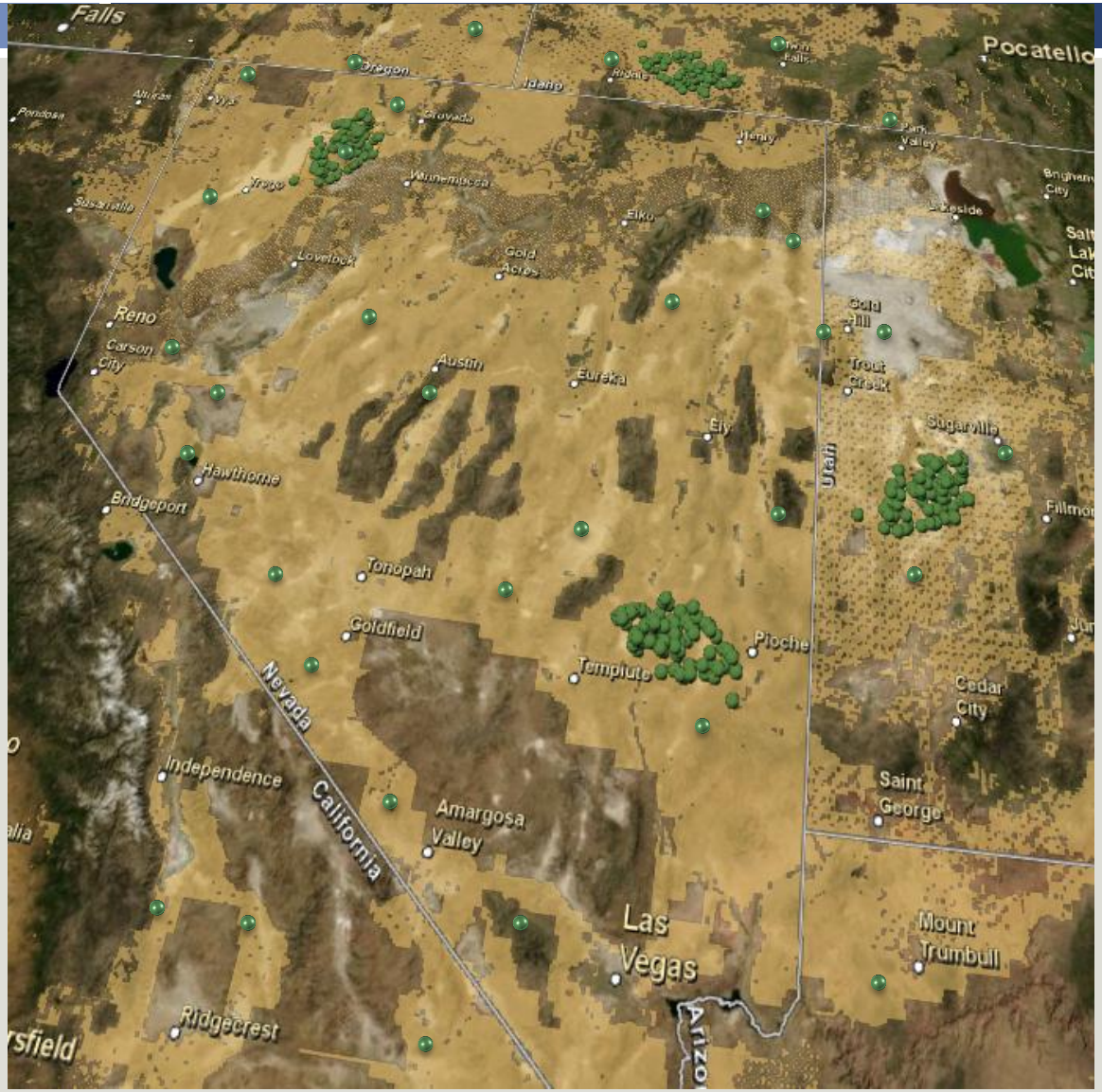
- Low density network of sampling locations

Intensive Sampling

- Higher-density sampling
- Designed to meet local management needs
- Can make-use of extensive samples
- Insufficient coverage to use alone for national/ regional needs
  - *Can be folded into extensive network to improve estimates*

*Hypothetical extensive monitoring network

Sample Design



Extensive Sampling*

- Low density network of sampling locations

Intensive Sampling*

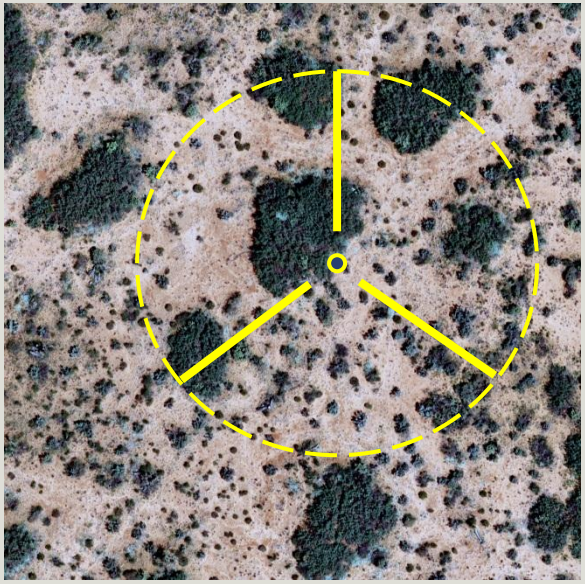
- Higher-density sampling for local management needs

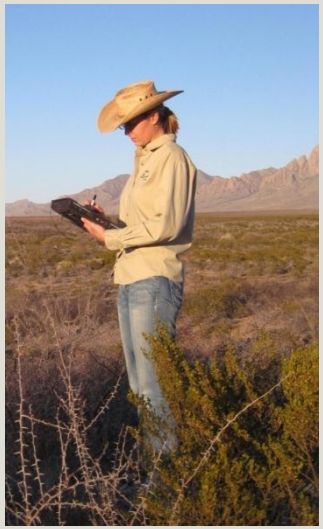
Integrated Sampling

- Intensive data combined with extensive network
- Increases precision of extensive sampling resource estimates
- Comparability of resource values across scales and jurisdictions

*Hypothetical points for illustration only

Field Data





Collecting and calculating Core Indicators

Sagebrush cover example

- Line-point intercept
- Produce plot-level estimates from points along transects

% Sagebrush Cover =

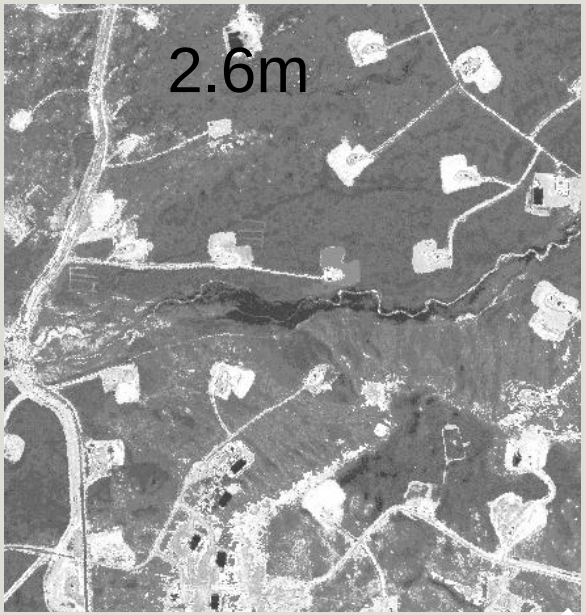
$$\frac{\text{\# Sagebrush “hits” (over all transects)}}{\text{total \# of transect points}}$$

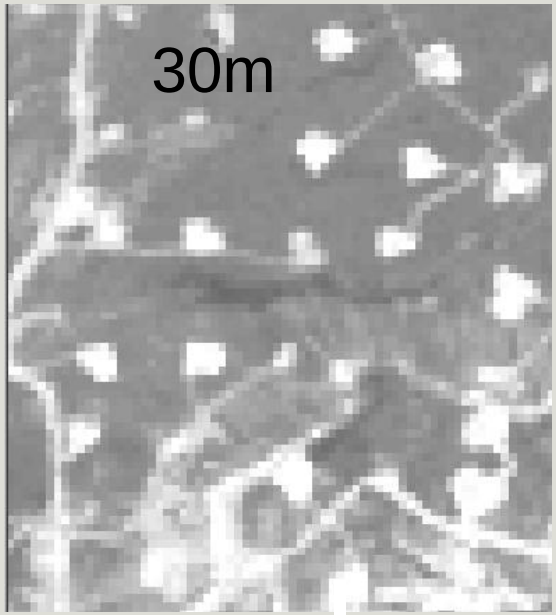
% Sagebrush = 58/150 = 38.67%

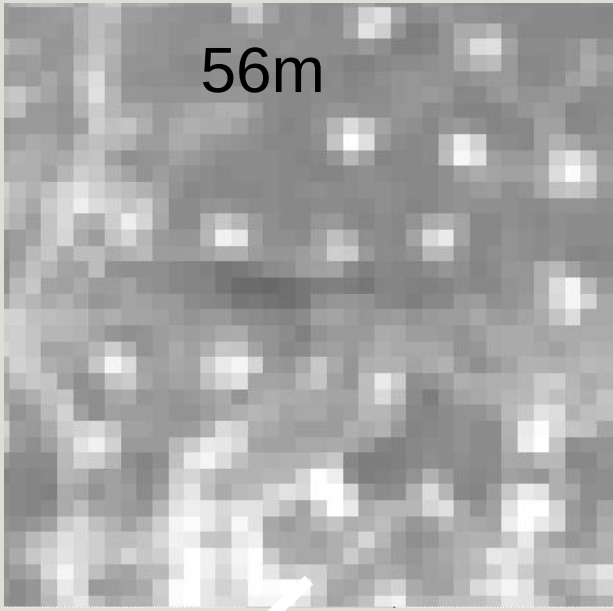
This is a plot-level estimate

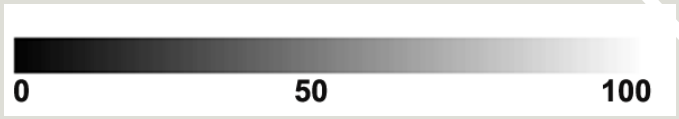
Remote Sensing Integration

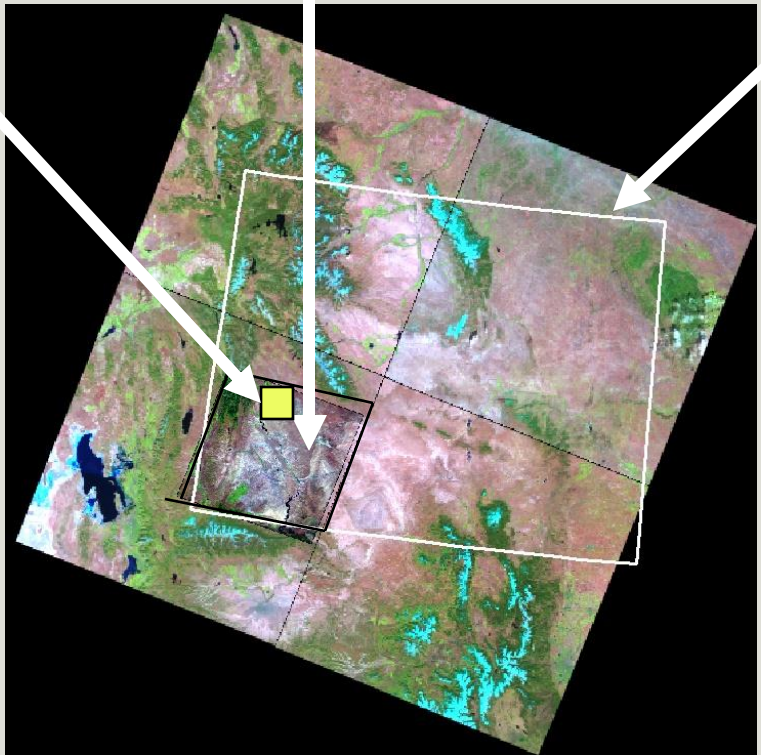
- Using field and remote sensing data together to derive reliable information
- Examples include
  - Percent cover continuous data models
  - Status and trend, with location and abundance
  - Landscape ecology (connectivity, patch size, etc.)
  - Surface disturbance mapping
  - Change detection
  - Field data to train/validate RS products
  - RS data to aid selection of field sampling locations











Percent Bare Ground estimate @ 3 scales

USGS

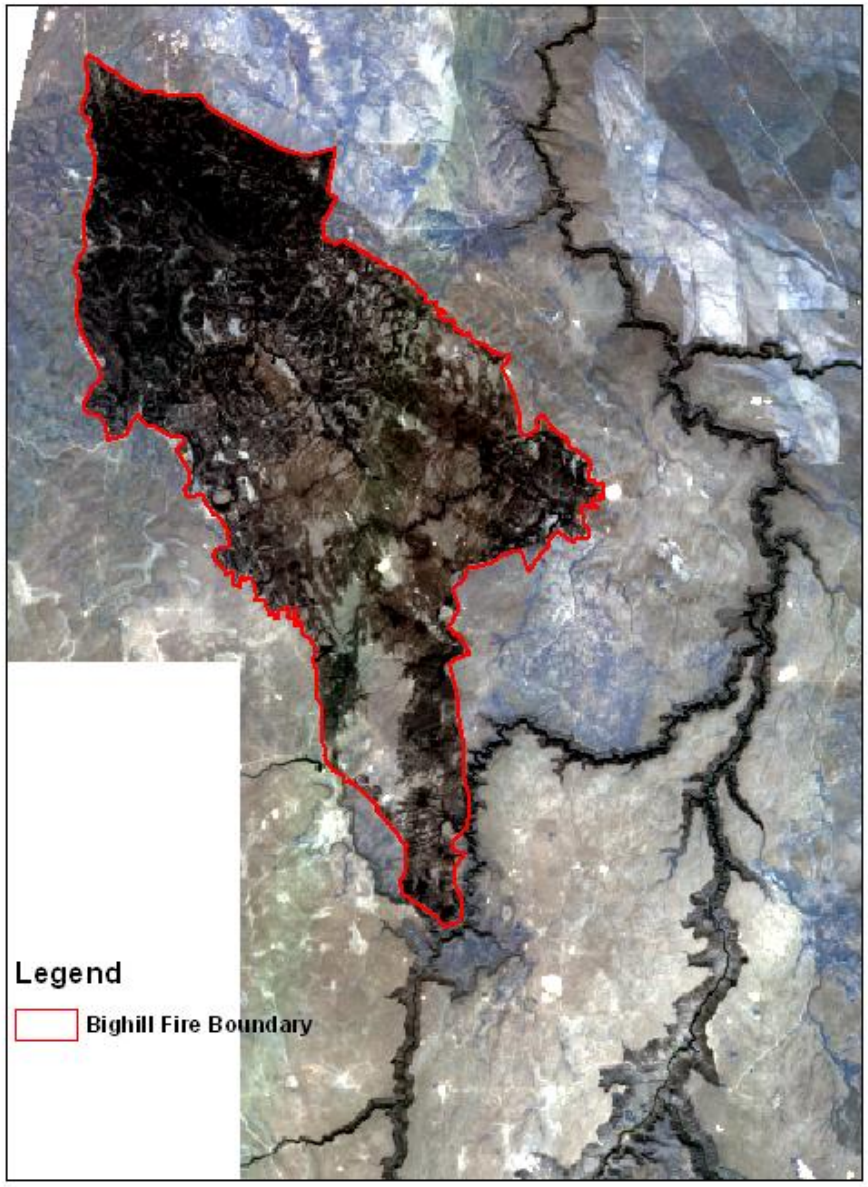
Field Level Remote Sensing

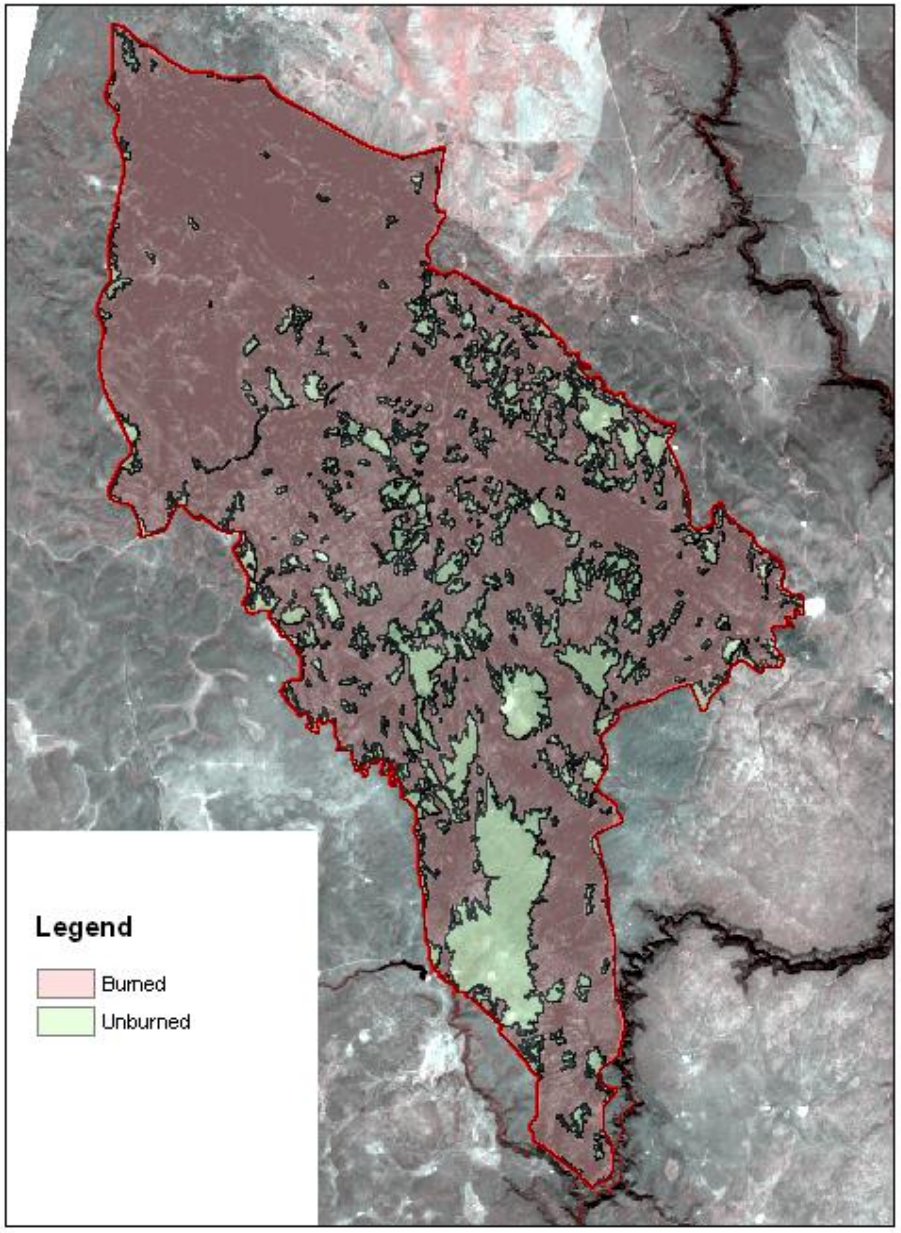
Fire Example

- Two fires in Southwest Idaho: Big Hill and Blair
- Boise District Office requests need for imagery
- Emergency Stabilization and Rehab (ES&R) are developing their plan
- Not successful in acquiring cloud-free Landsat
- Needed data as fast as possible
  - Had a short-term option
  - Need a long-term one

Work flow

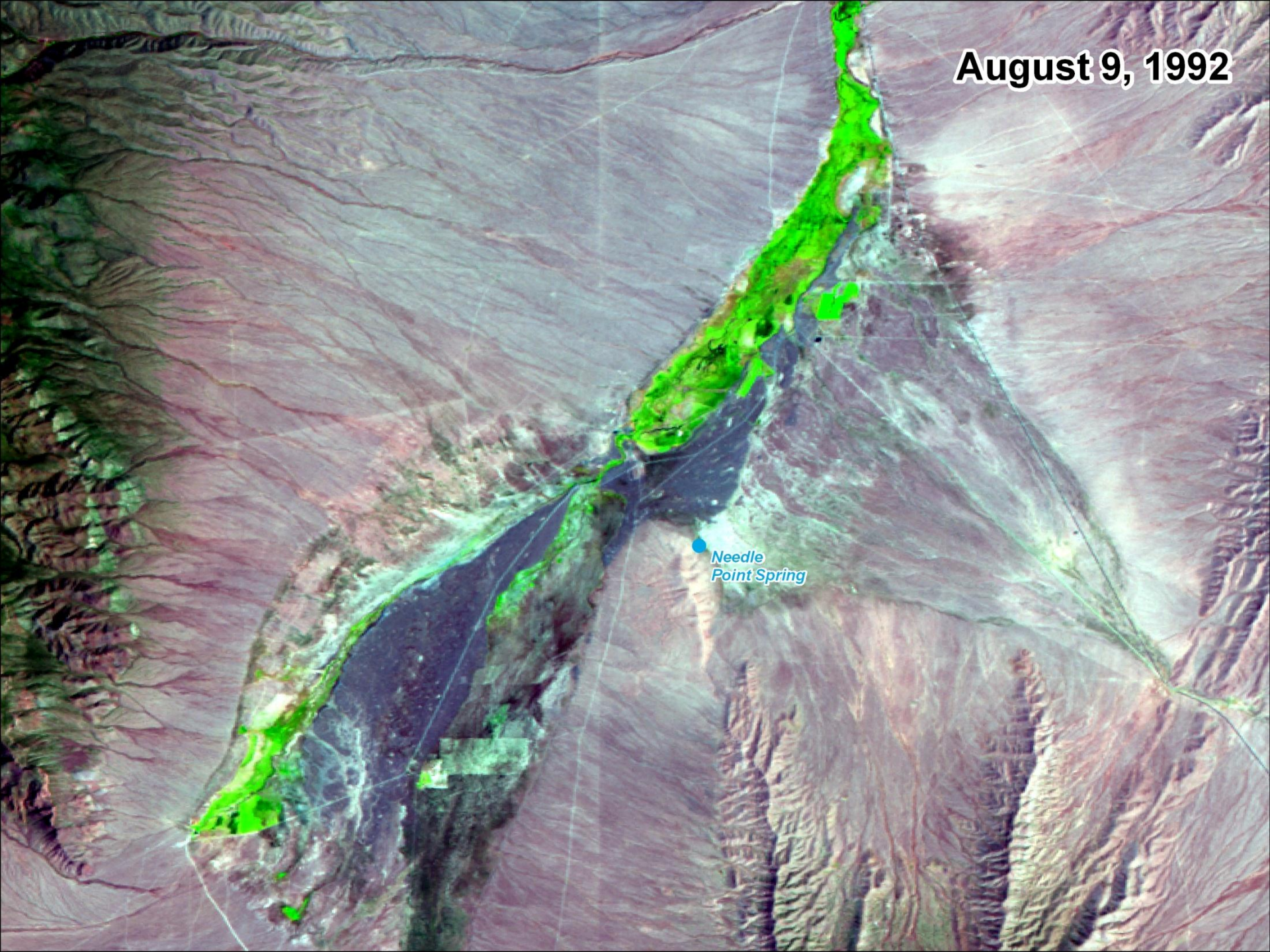
- Acquire RapidEye Imagery
  - Downloaded data within a day and half of request
- Pre-process data
- Publish image service for base imagery
  - 30 Minutes of downloading
- Image Classification
  - Segmentation in eCognition
  - Collect training samples on the image
  - Perform burned vs unburned classification
- Publish final web service with imagery and classification
  - Half a day of work
- Share data with partners for further processing

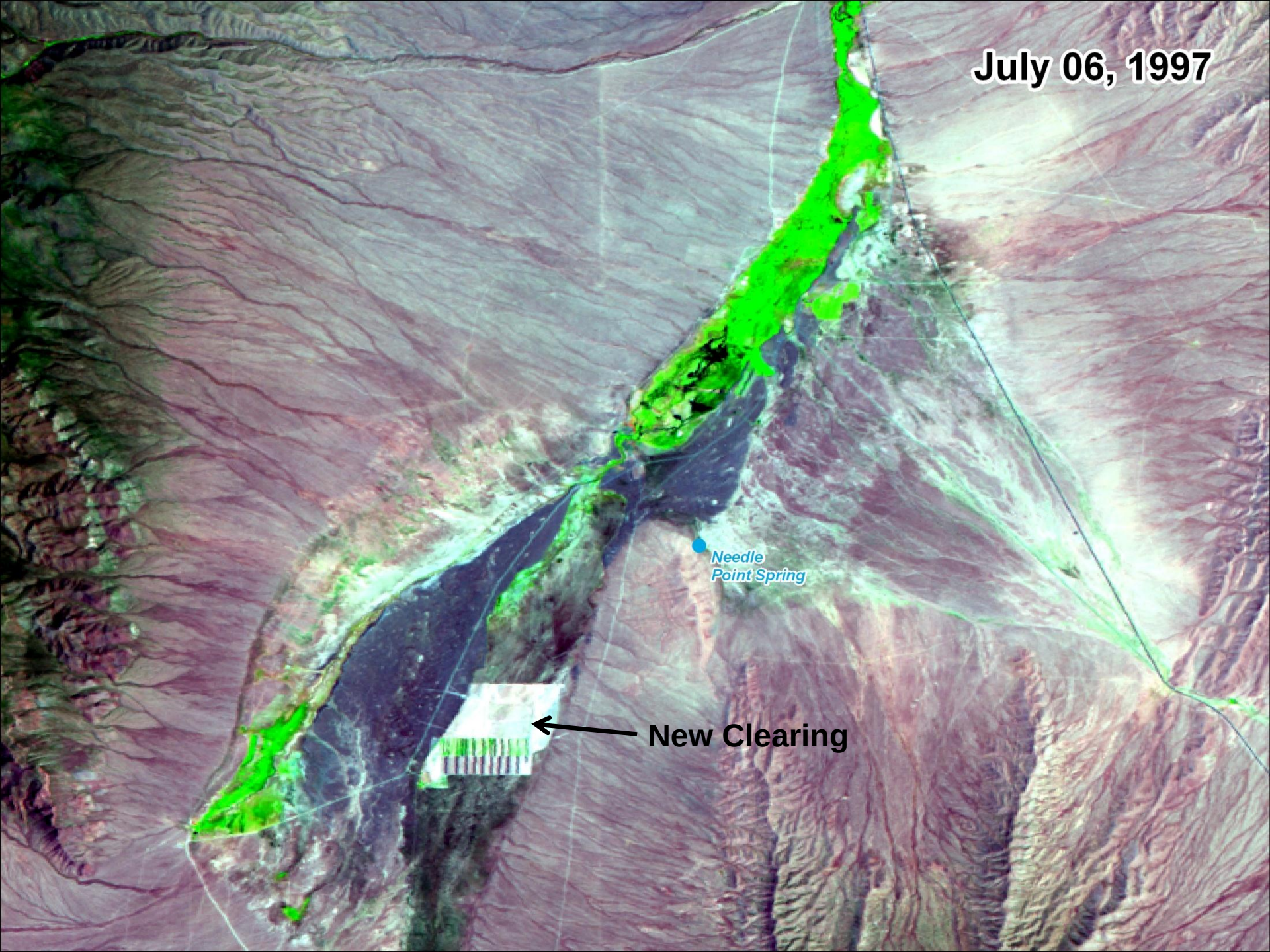

Legend
Bighill Fire Boundary

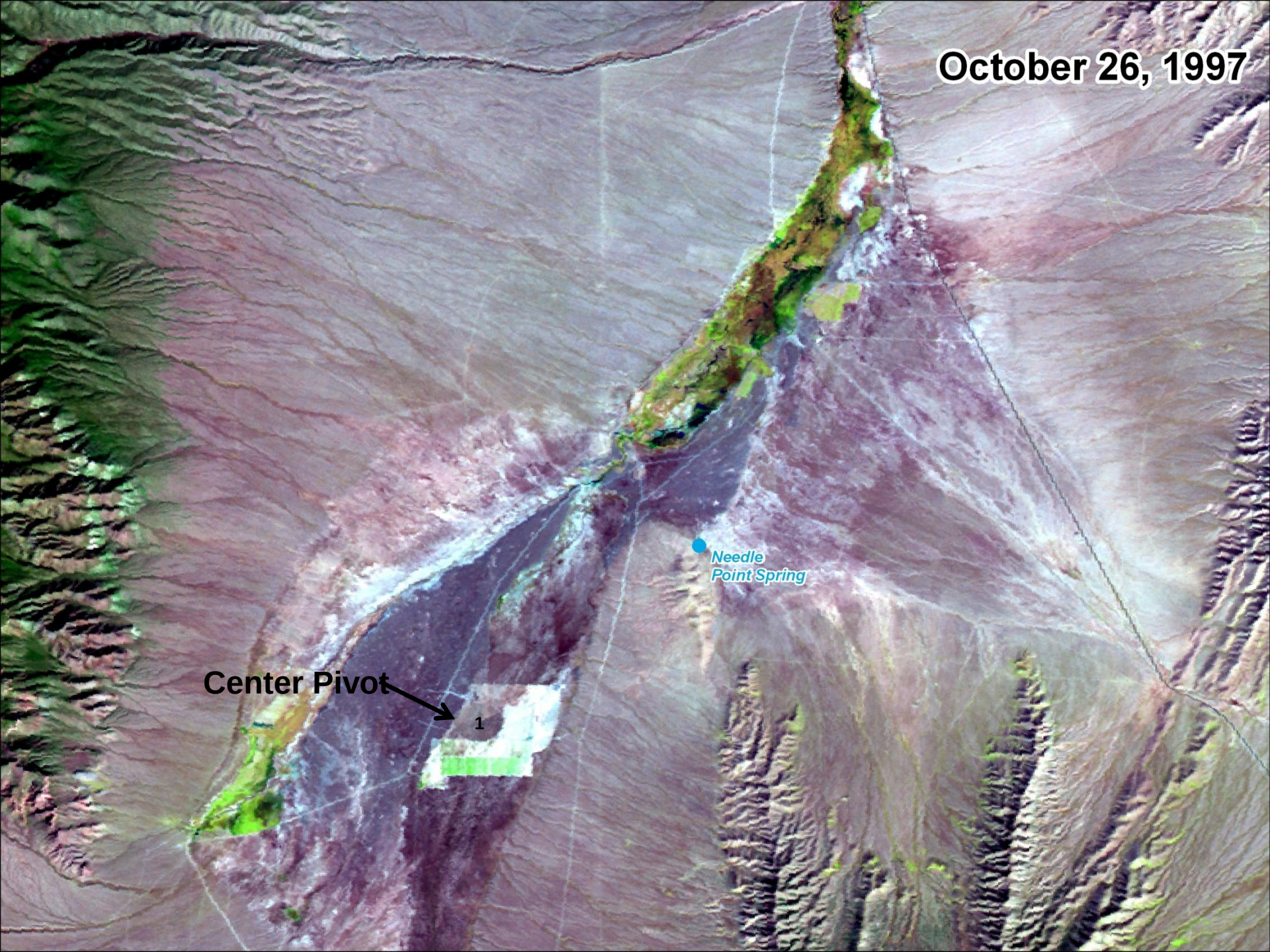

Legend
Burned
Unburned

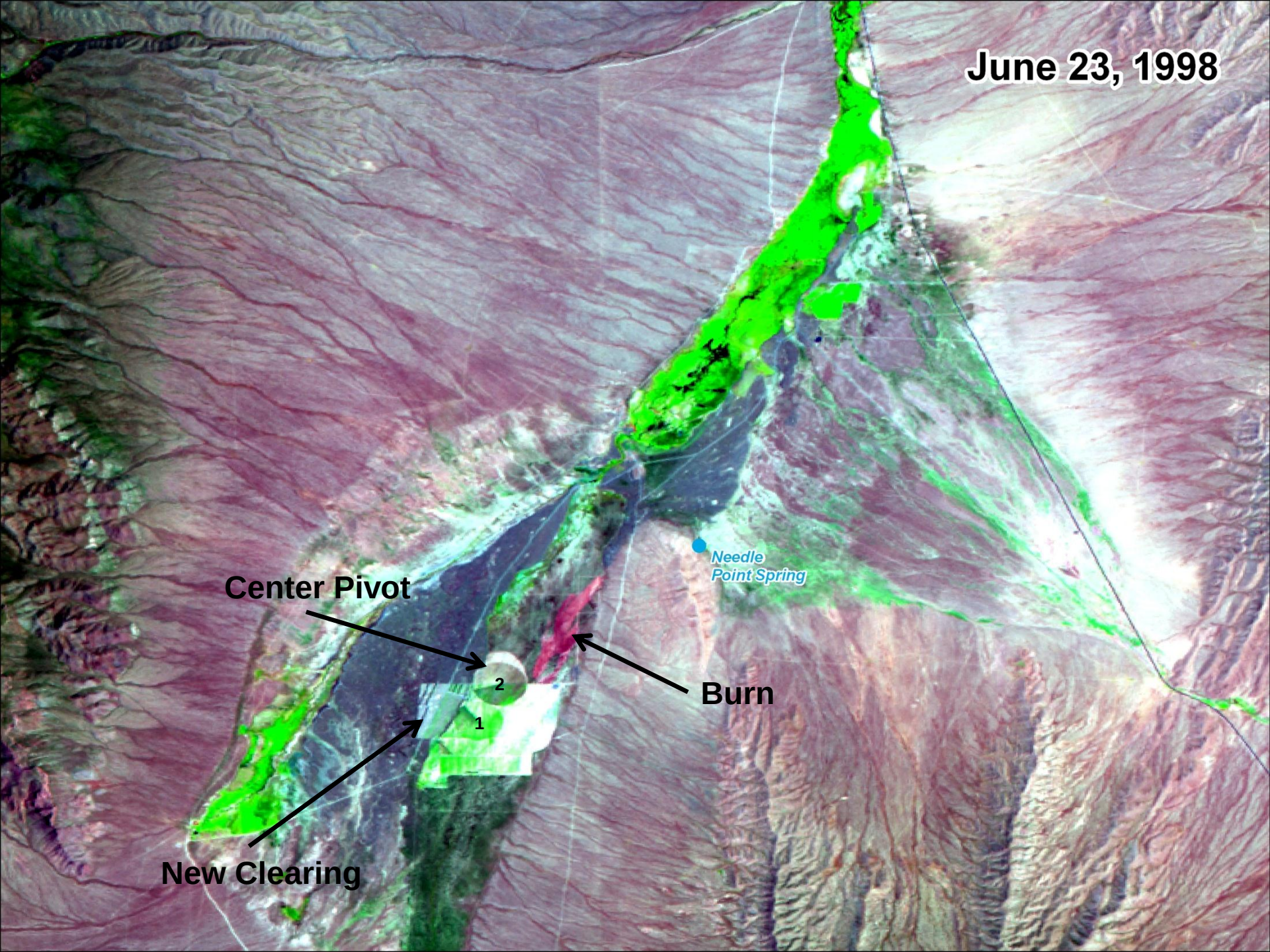
Legal Example

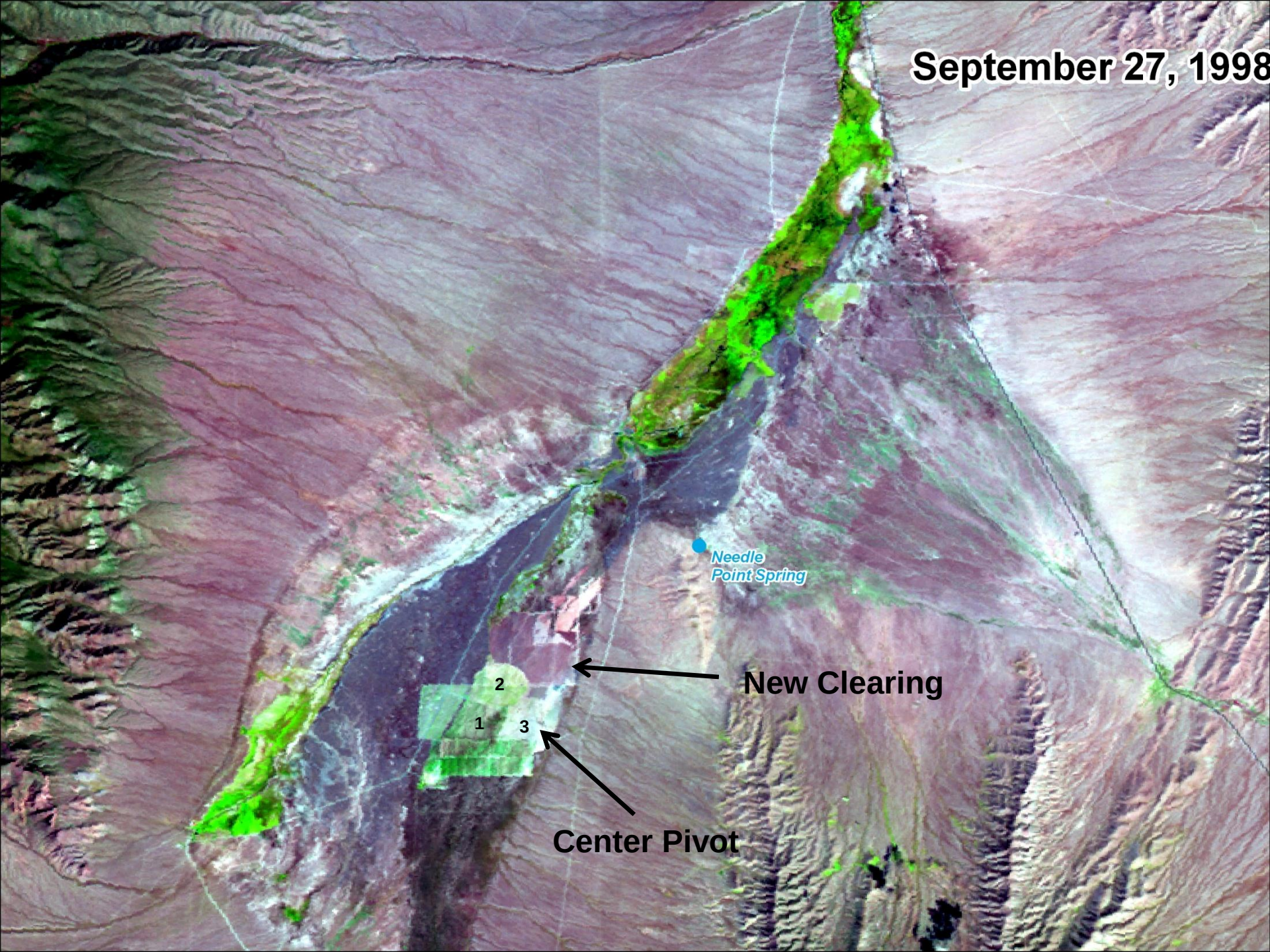
- Water Rights Dispute over the de-watering of the Needle Point Spring
- Request from the Richfield, UT Field Office
- Build historical chronology of center pivot agricultural field development
- Searched, downloaded, and prepared Landsat imagery – Week of Work
- Need: Map Service to consume Landsat imagery
  - WELD

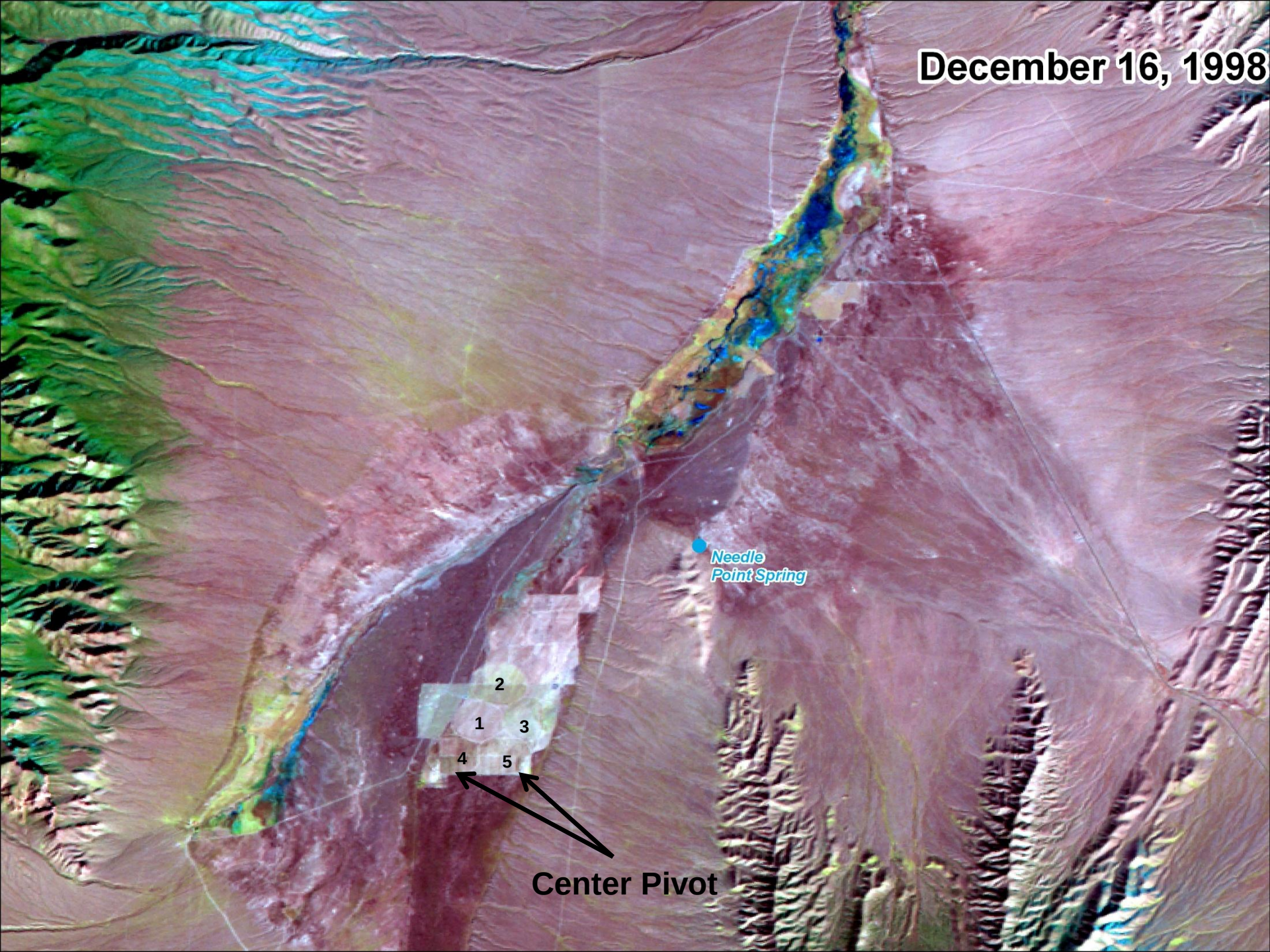

August 9, 1992
Needle
Point Spring

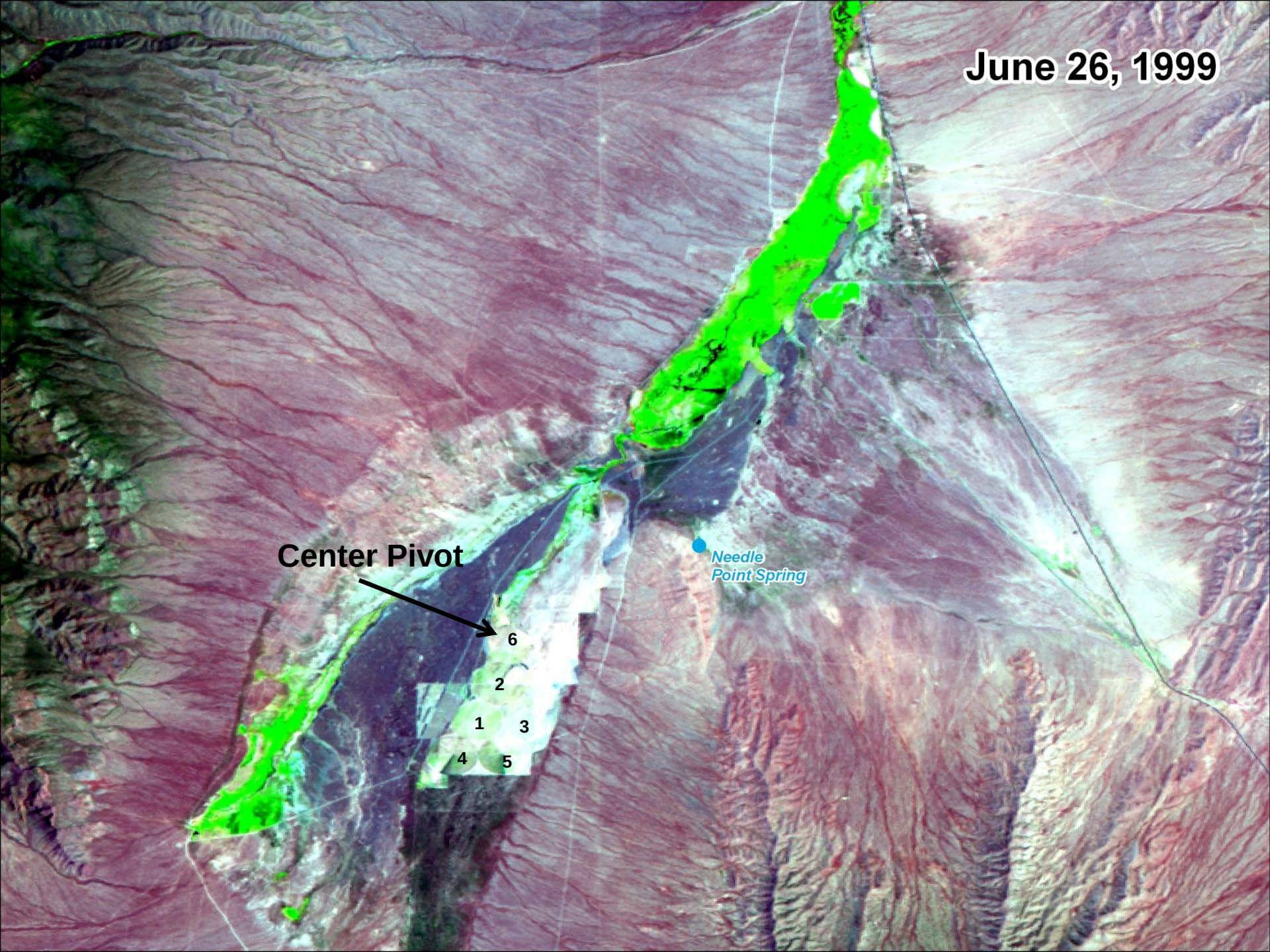

July 06, 1997
Needle
Point Spring
New Clearing

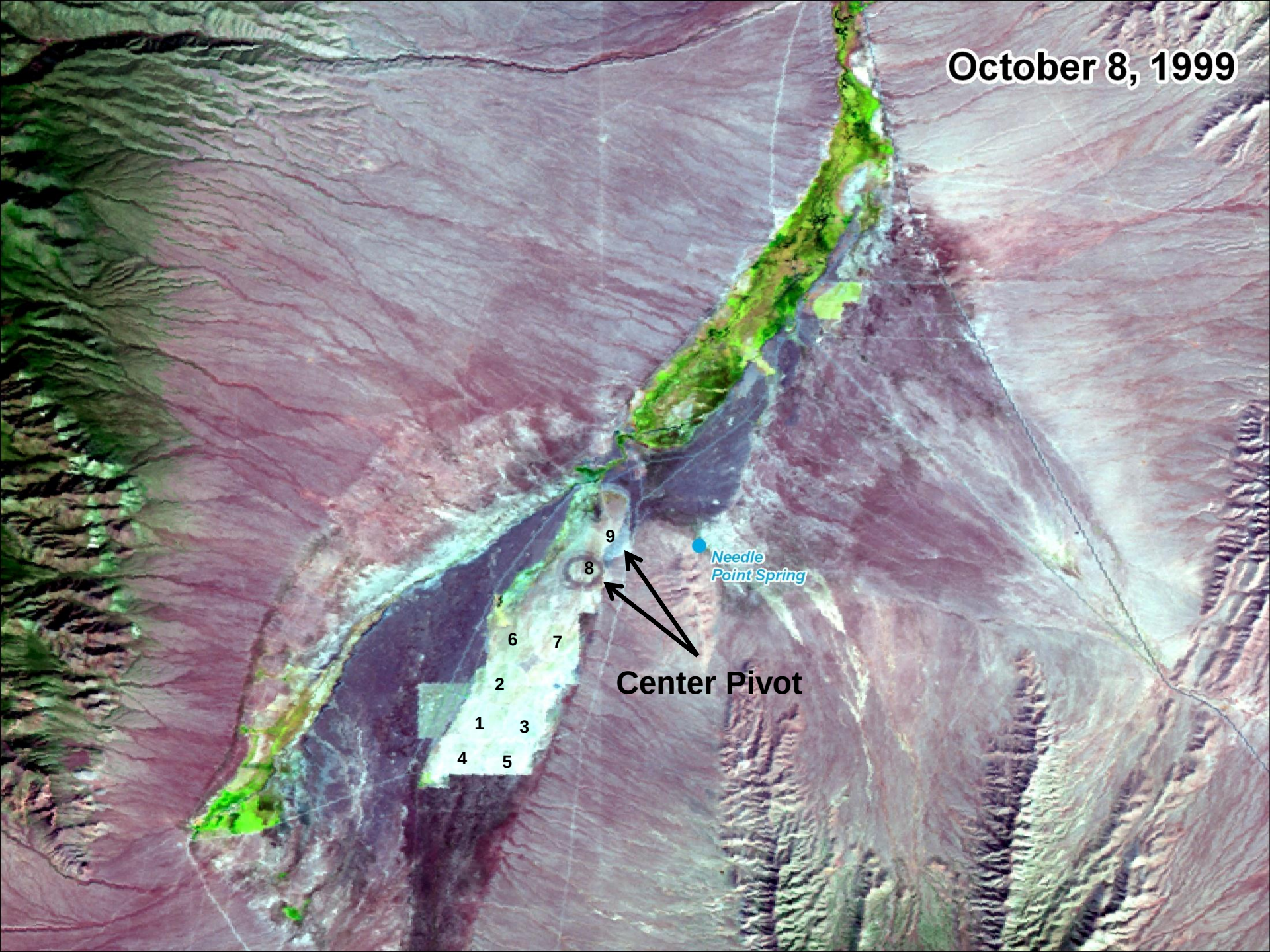

October 26, 1997
Needle
Point Spring
Center Pivot
1

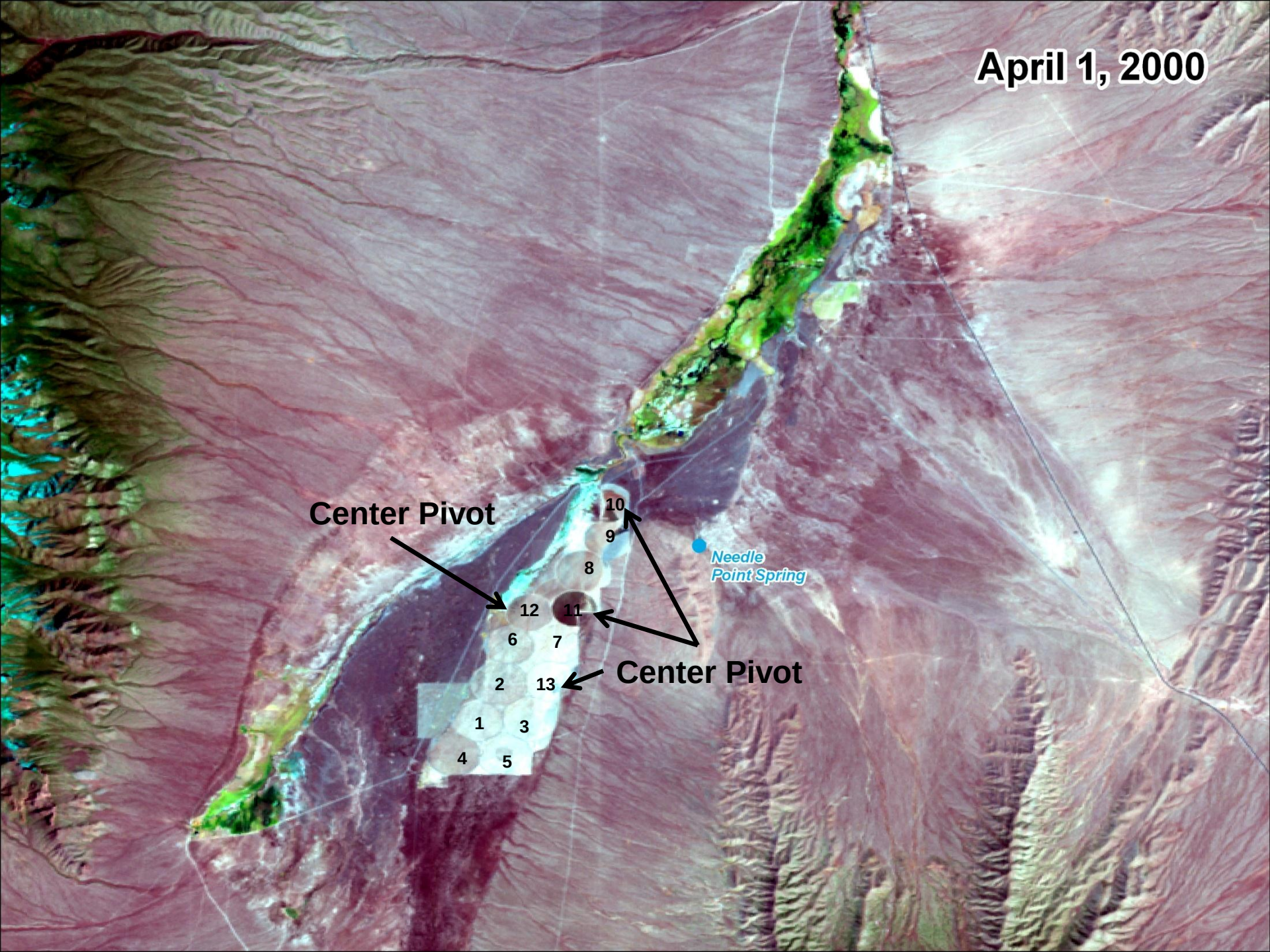

June 23, 1998
Needle
Point Spring
Center Pivot
2
1
Burn
New Clearing


September 27, 1998
Needle
Point Spring
New Clearing
2
1
3
Center Pivot


December 16, 1998
Needle
Point Spring
2
1
3
4
5
Center Pivot


June 26, 1999
Center Pivot
Needle
Point Spring
6
2
1
3
4
5


October 8, 1999
9
8
Needle
Point Spring
6
7
2
1
3
4
5
Center Pivot


April 1, 2000
Center Pivot
10
9
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12
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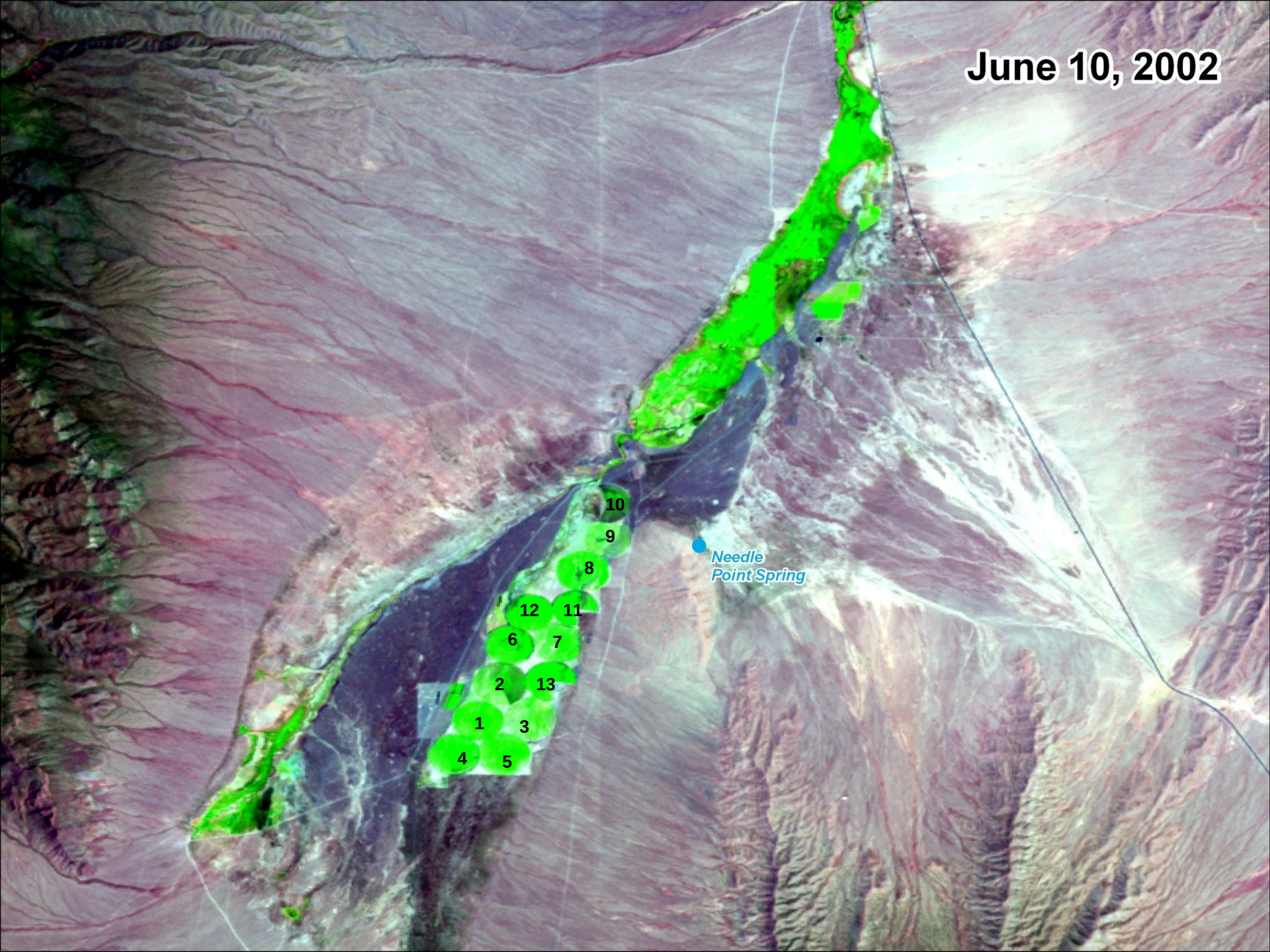
Needle
Point Spring
Center Pivot


June 10, 2002
10
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13
1
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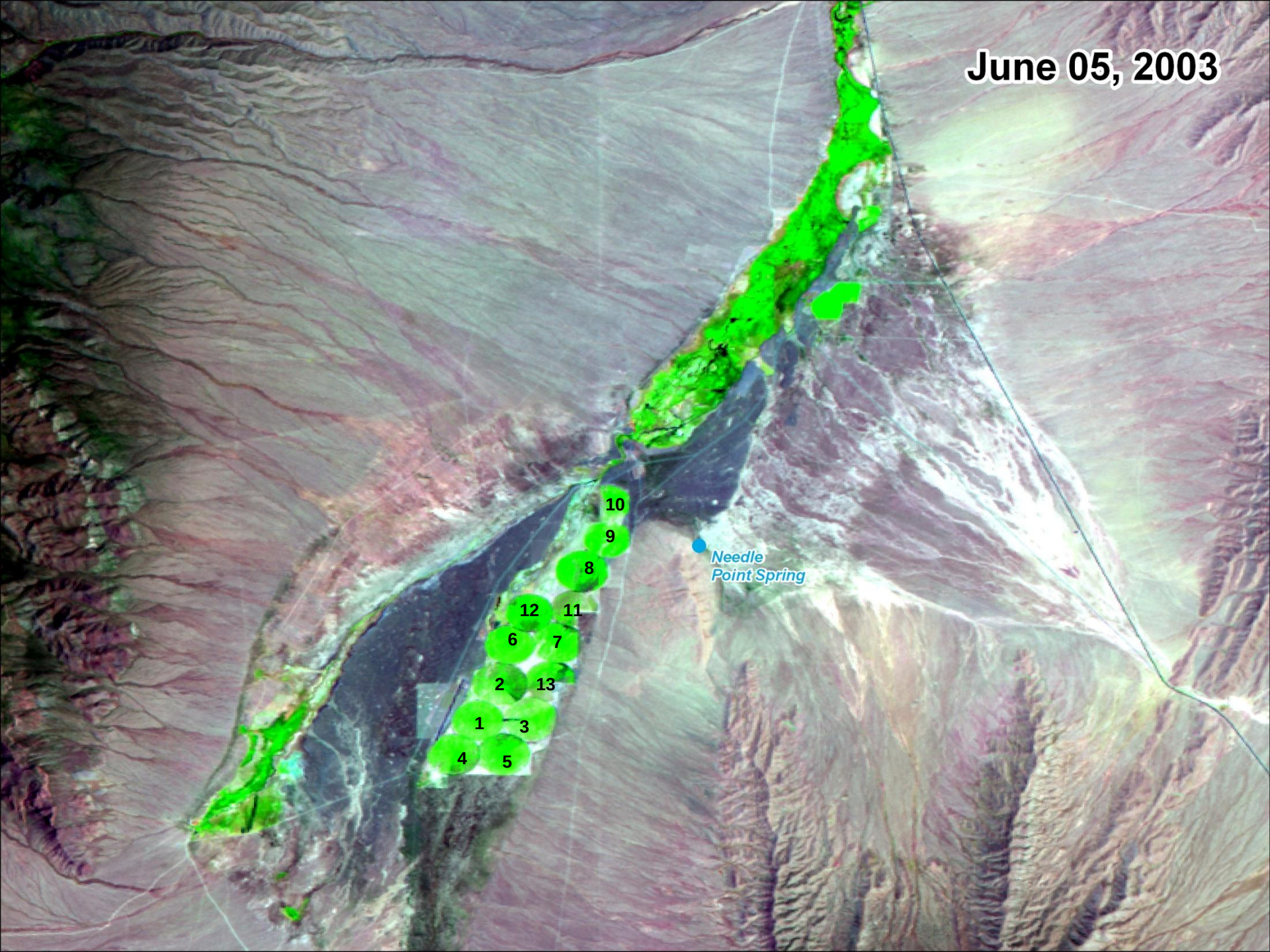
4
5
Needle
Point Spring


June 05, 2003
10
9
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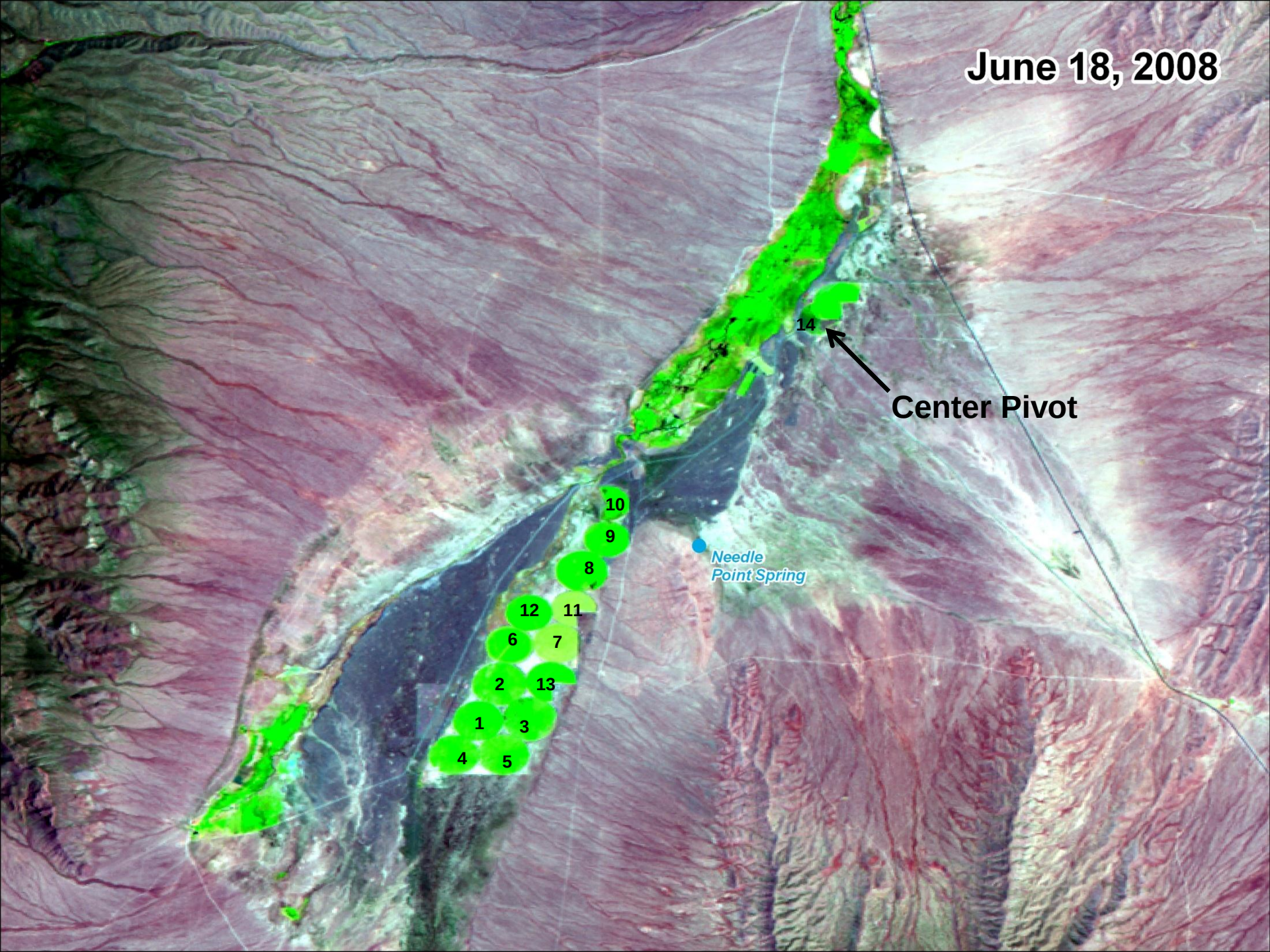
Needle
Point Spring


June 18, 2008
14
Center Pivot
10
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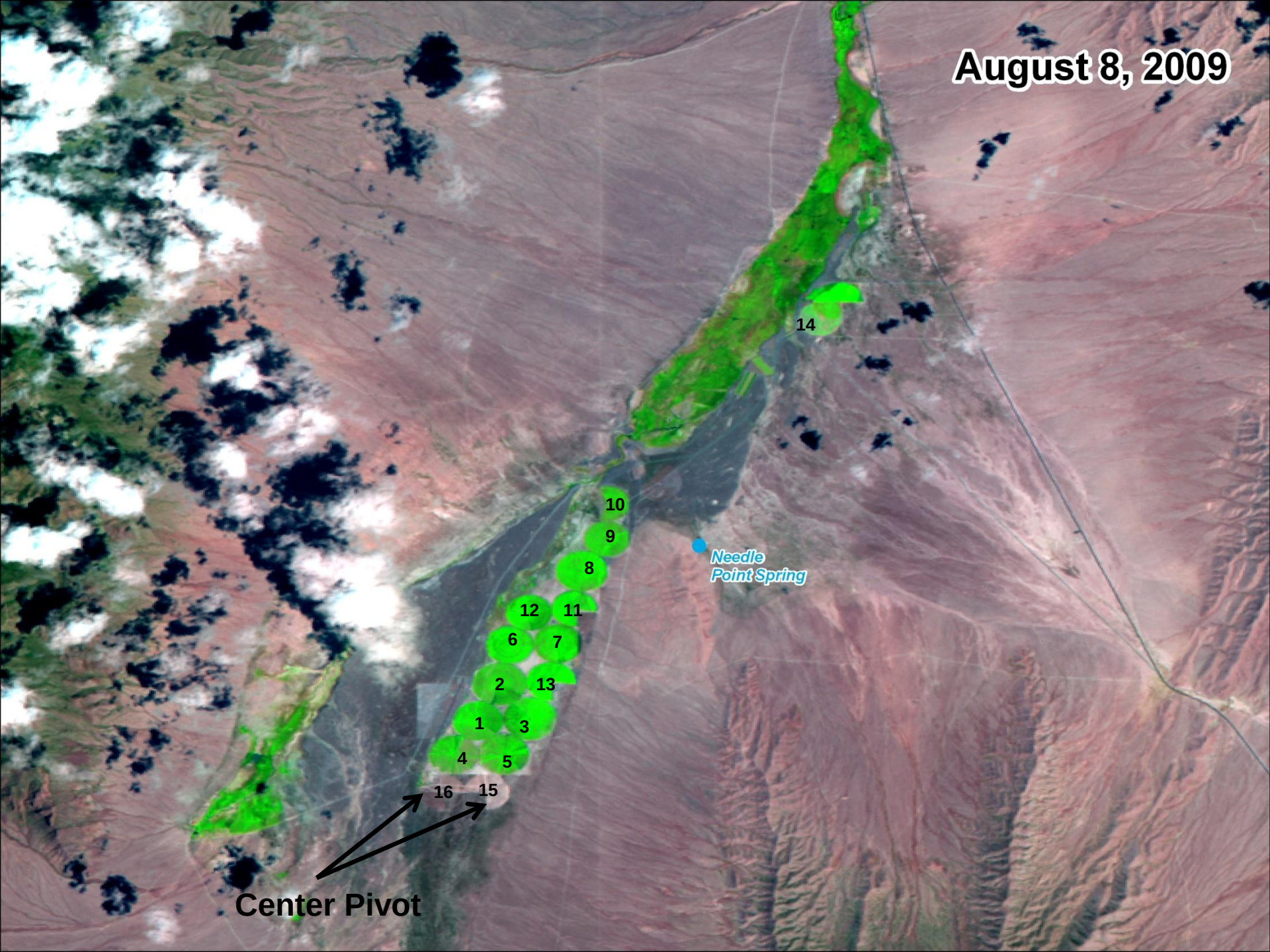
2
13
1
3
4
5
Needle
Point Spring


August 8, 2009
14
10
9
8
12
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13
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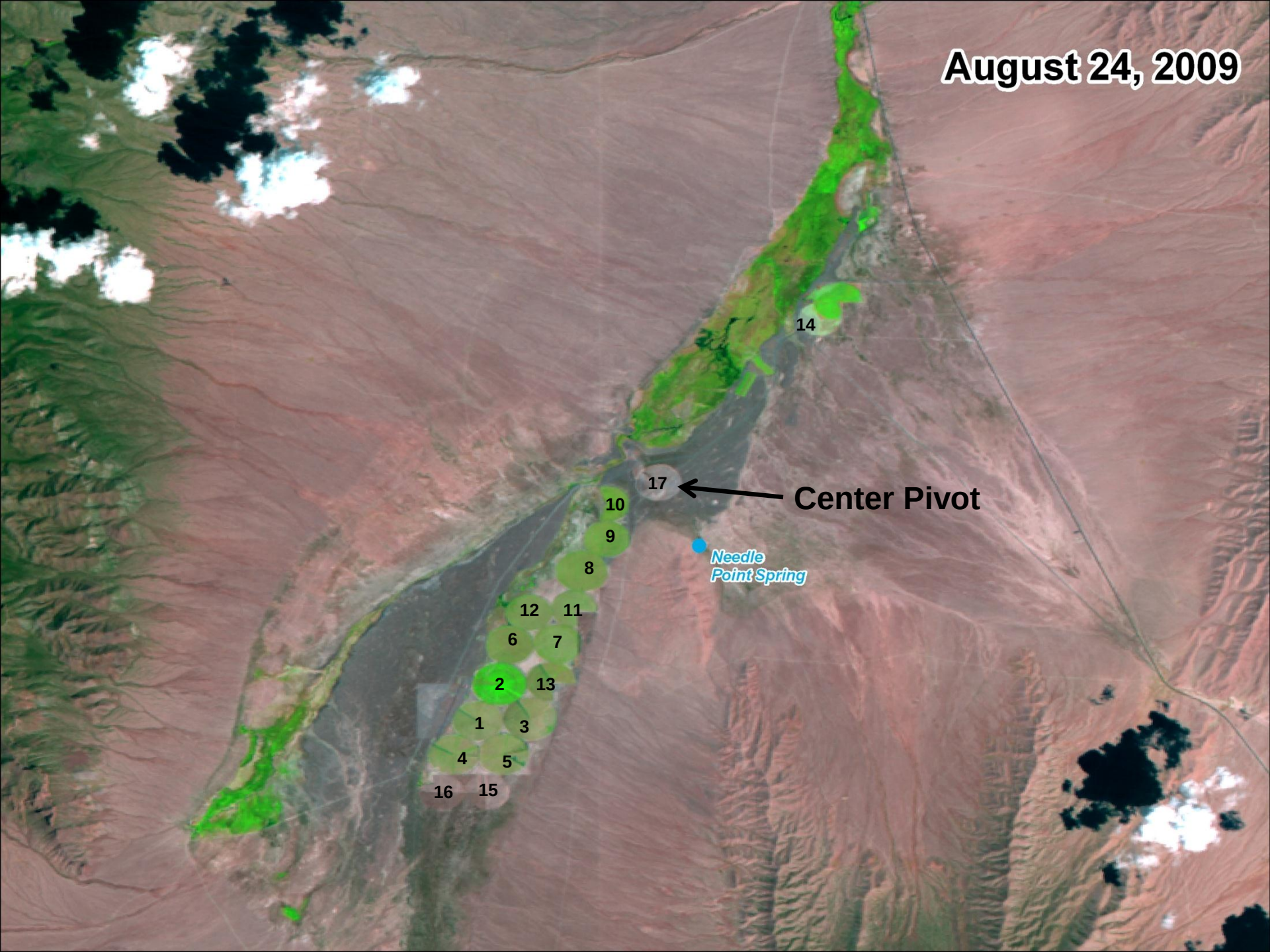
16
15
Needle
Point Spring
Center Pivot


August 24, 2009
14
17
Center Pivot
10
9
8
Needle
Point Spring
12
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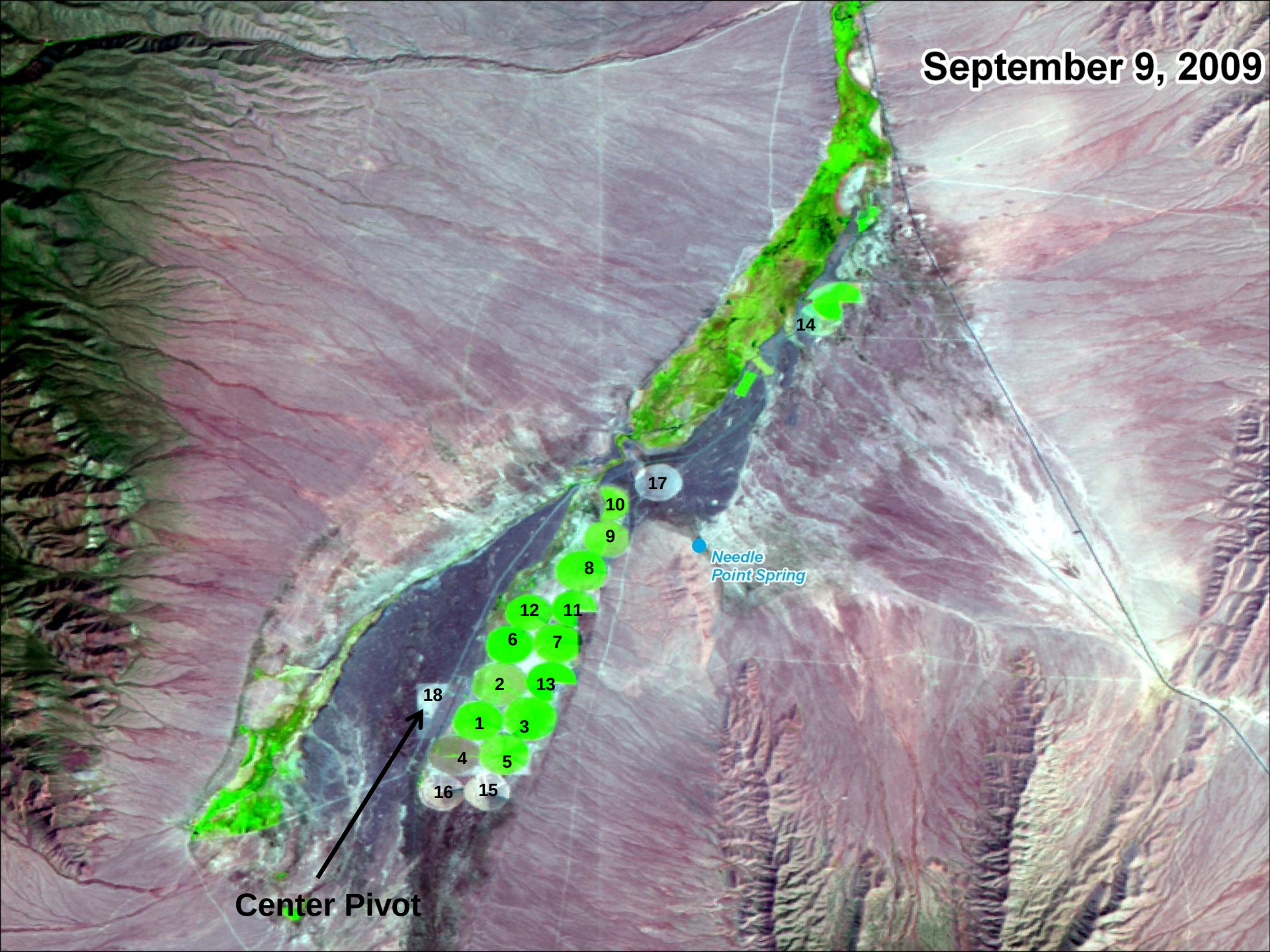
16
15


September 9, 2009
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18
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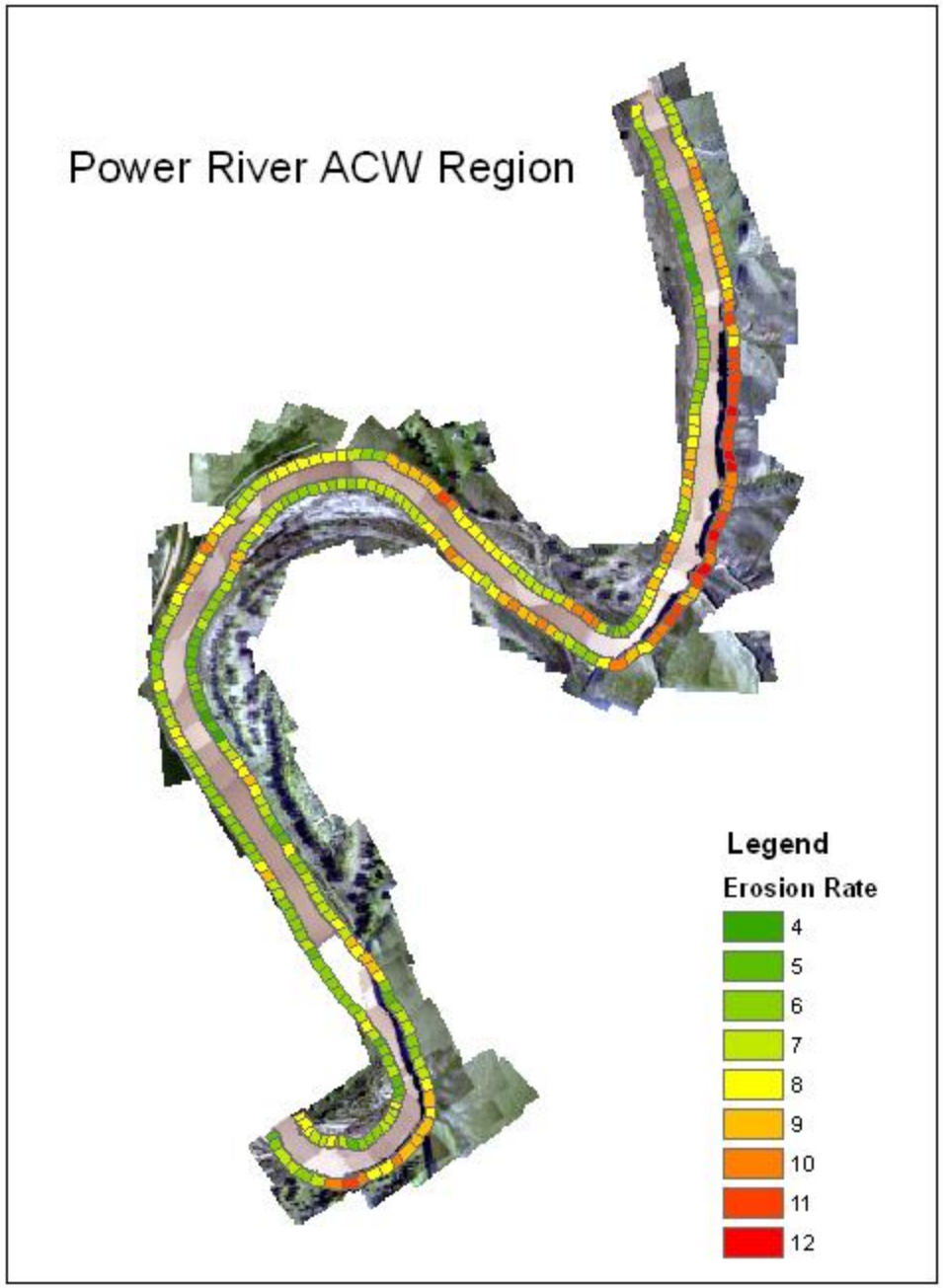
4
5
16
15
Needle
Point Spring
Center Pivot

Powder River Mapping &Monitoring

- Quantify in-stream habitats
  - Mapping verses Sampling
- Monitor in-stream habitats under different flow rates
  - Intra-annual and Inter-annual
- Derived measurements of channel properties
  - Index of Bank Stability
- Map riparian vegetation and invasive species
- Test new methods for developing stereo models from Very Large Scale Aerial (VLSA) photography

Powder River Monitoring

- Orthoimages and Digital Terrain Models for 2008, 2009, and 2010.
- Both orthoimages and DTMs are derived from stereo aerial photos
- Resolution = 0.1m; Absolute Accuracy ~0.75m; Relative Accuracy ~0.02m for one model


Power River ACW Region
Legend
Erosion Rate
4
5
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12